

GEPHE SUMMARY

	Gephebase Gene	GephelD
Dopamine N-acetyltransferase (Dat) (https://www.gephebase.org/search-criteria/?and+Gene+Gephebase=Dopamine+N-acetyltransferase(Dat)+#gephebase-summary-title)	GP00000234	Main curator
	Entry Status	
Published		

PHENOTYPIC CHANGE

	Trait Category	
Morphology (#gephebase-summary-title)	Trait	
Coloration (puparium) (https://www.gephebase.org/search-criteria/?and+Trait=Coloration(puparium) #gephebase-summary-title)	Trait State in Taxon A	
Drosophila americana	Trait State in Taxon B	
Drosophila virilis	Ancestral State	
Taxon A	Taxonomic Status	
Interspecific (https://www.gephebase.org/search-criteria/?and+Taxonomic+Status=Interspecific #gephebase-summary-title)		
Taxon A		Taxon B
Drosophila americana (#gephebase-summary-title)	Latin Name	Latin Name
-	Common Name	Common Name
-	Synonyms	Synonyms
-	Rank	Rank
species	Lineage	Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Drosophila; virilis group		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Brachycera; Muscomorpha; Eremoneura; Cyclorrhapha; Schizophora; Acalyptratae; Ephydroidea; Drosophilidae; Drosophilinae; Drosophilini; Drosophila; Drosophila; virilis group
virilis group () - (Rank: species group) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=32335)	Parent	Parent
40366 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=40366)	NCBI Taxonomy ID	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

AANAT1	Generic Gene Name	UniProtKB Drosophila melanogaster
	Synonyms	GenebankID or UniProtKB
AANAT; AA-NAT1; aaNat; aaNAT; aaNAT1; Aanat1; AANATA; AANATB; CG3318; DAT; Dat1; Dmel\CG3318; NAT1; Dat	Q94521 (http://www.uniprot.org/uniprot/Q94521)	0
7227.FBpp0089101 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0089101)	String	
-	Sequence Similarities	
GO:0004059 : aralkylamine N-acetyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004059)	GO - Molecular Function	
GO:0004060 : arylamine N-acetyltransferase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004060)		

GO:0008080 : N-acetyltransferase activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0008080>)

GO - Biological Process

GO:0042420 : dopamine catabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0042420>)
GO:0006584 : catecholamine metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006584>)
GO:0048066 : developmental pigmentation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048066>)
GO:0030187 : melatonin biosynthetic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030187>)
GO:0046334 : octopamine catabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0046334>)
GO:0045187 : regulation of circadian sleep/wake cycle, sleep
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045187>)
GO:0042429 : serotonin catabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0042429>)
GO:0030431 : sleep (<https://www.ebi.ac.uk/QuickGO/term/GO:0030431>)

GO - Cellular Component

GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)

Presumptive Null

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=^Unknown^#gephebase-summary-title>)

Molecular Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=^Unknown^#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=^Unknown^#gephebase-summary-title>)

Molecular Details of the Mutation

Not identified ; 11kb mapped interval including regulatory region and first exon

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=^Linkage+Mapping^#gephebase-summary-title>)

Main Reference

A single gene causes an interspecific difference in pigmentation in Drosophila. (2015) (<https://pubmed.ncbi.nlm.nih.gov/25769982>)

Authors

Ahmed-Braimah YH; Sweigart AL

Abstract

The genetic basis of species differences remains understudied. Studies in insects have contributed significantly to our understanding of morphological evolution. Pigmentation traits in particular have received a great deal of attention and several genes in the insect pigmentation pathway have been implicated in inter- and intraspecific differences. Nonetheless, much remains unknown about many of the genes in this pathway and their potential role in understudied taxa. Here we genetically analyze the puparium color difference between members of the virilis group of *Drosophila*. The puparium of *Drosophila virilis* is black, while those of *D. americana*, *D. novamexicana*, and *D. lummei* are brown. We used a series of backcross hybrid populations between *D. americana* and *D. virilis* to map the genomic interval responsible for the difference between this species pair. First, we show that the pupal case color difference is caused by a single Mendelizing factor, which we ultimately map to an $\sim 1/4$ 11-kb region on chromosome 5. The mapped interval includes only the first exon and regulatory region(s) of the dopamine N-acetyltransferase gene (*Dat*). This gene encodes an enzyme that is known to play a part in the insect pigmentation pathway. Second, we show that this gene is highly expressed at the onset of pupation in light brown taxa (*D. americana* and *D. novamexicana*) relative to *D. virilis*, but not in the dark brown *D. lummei*. Finally, we examine the role of *Dat* in adult pigmentation between *D. americana* (heavily melanized) and *D. novamexicana* (lightly melanized) and find no discernible effect of this gene in adults. Our results demonstrate that a single gene is entirely or almost entirely responsible for a morphological difference between species.

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Additional References

RELATED GEPHE

Related Genes

3 (Dat, ebony, tan) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=^40366^/and+Trait=Coloration/or+Taxon+ID=^7244^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

